National Survey on Prevalence of Hearing Impairment in Bangladesh 2013

Department of Otolaryngology &
Head-Neck Surgery

NCDC
Directorate General of Health Services

Ministry of Health & Family Welfare

World Health
Organization
Country Office for Bangladesh

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Vice Chancellor
Bangabandhu Sheikh
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Foreword

The 'National Survey on Prevalence of Hearing Impairment in Bangladesh 2013' is the first ever population based national survey of deafness in Bangladesh. This study is not just important for Bangladesh, but also for the global programme on deafness prevention. This kind of national level data are not available for many countries in the world.

I gratefully acknowledge the Directorate General of Health Services and Ministry of Health and Family Welfare for their confidence on us to carry out this gigantic national survey. I sincerely express my gratitude to the World Health Organization (WHO) also for its technical support. WHO technical team supported us in designing the study, training the field enumerators and executing it at field level. I must convey our gratitude to Dr M Mostafa Zaman of WHO, whose support and guidance was critical for us to complete such a high quality job in time.

I must convey my gratitude to the investigators, research physicians, field interviewers, and above all the participants who spent their valuable time to provide data. Professor Abul Hasnat Joarder of BSMMU provided a space and support for running the project office for this survey.

Because this survey has given nationally representative data on hearing impairment, this report will help formulating the prevention strategy on hearing impairment in Bangladesh.

Professor Pran Gopal Datta

Secretary
Ministry of Health and Family Welfare
Government of the Peoples' Republic of Bangladesh

Message

I am very much pleased to know that the Department of Otolaryngology & Head-Neck Surgery, Bangabandu Sheikh Mujib Medical University has successfully completed the National Survey on Prevalence of Hearing Impairment in Bangladesh 2013.

Hearing impairments are causing serious harms to the society both in terms of health and economic effects. For effective control and prevention of hearing impairment national prevalence data are required. I am sure that this survey report will provide us valuable information in this regard. I gratefully acknowledge the technical support provided by the World Health Organization for the survey.

I believe that substantial capacity among the professional group has been developed through this survey which will be helpful for doing further survey at national level.

M. M. Neazuddin

Director General of Health Services
Government of the Peoples' Republic of Bangladesh

Message

It gives me an immense pleasure to know that Bangabandu Sheikh Mujib Medical University has completed the National Survey on Prevalence of Hearing Impairment in Bangladesh 2013 maintaining the requisite quality. I thank Bangabandhu Sheikh Mujib Medical University for successful completion of the survey.

Hearing impairment has become a leading cause of disability in developing countries. I am sure that the data from this survey will help us knowing the current status of hearing impairment. Based on the findings of this survey, we need to design appropriate intervention programme for specific target groups.

I thank the World Health Organization for its technical support. This study has the present Government's commitment for a healthier nation a step ahead.

Professor Dr Khondhaker Md. Shefyetullah

World Health Organization
Country Office for Bangladesh

Message

Hearing impairment is a major preventable cause of disability. This national survey provides us population level burden data of hearing impairment using a standardized approach that will allow cross-country comparisons.

I would like to mention that World Health Organization did timely respond on the call of Professor Pran Gopal Datta, Vice Chancellor, Bangabandhu Sheikh Mujib Medical University (BSMMU) to support the survey. The Department of Otolaryngology and Head-Neck Surgery of BSMMU has done an excellent job in doing the field work in spite of many hardships. It was our real pleasure to work with BSMMU for such a landmark achievement.

According to this report the disabling hearing loss is very common in Bangladesh. Therefore the deafness prevention programme should be designed and implemented with due integration in to the existing primary health care system of the Country.

Dr Thushara Fernando
WHO Representative to Bangladesh

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Table of Contents

List of Acronyms

ABC	Absolute Bone Conduction
ASOM	Acute Suppurative Otitis Media
BSMMU	Bangabandhu Sheikh Mujib Medical University
COM	Chronic Otitis Media
CSOM	Chronic Suppurative Otitis Media
dB	Decibels
EAC	External Auditory Canal
OAE	Otoacoustic Emission
OME	Otitis Media with Effusion
PTA	Pure Tone Audiometry
WHO	World Health Organization

List of Boxes, Figures and Tables

TEXTBOXES

FIGURES

TABLES

Executive Summary

Hearing impairment is one of the leading causes of disability in Bangladesh. This is responsible for economic, social, educational and vocational problems for both the victims and the country. Half of the hearing impairment can be prevented through public awareness, early detection and proper management. Planning of public health interventions needs essential national level evidence which is lacking in Bangladesh. The current nationwide survey was aimed at determining the prevalence of ear diseases and hearing impairment in Bangladesh.

Methods

This national survey is a cross-sectional study, which adopted a multistage, geographically clustered, probability-based sampling approach, covering a representative sample of males and females of all ages. The field work was done from January to May 2013.

Mauza and *mahalla* are the smallest geographical units with defined boundaries in rural and urban areas, respectively, of Bangladesh. They were used as primary sampling units for this study. Fifty two primary sampling units (11 urban and 41 rural) were selected from seven divisions proportionate to the size of their population. This was followed by a random selection of households (secondary sampling unit) from selected primary sampling units (80 from *mauza* and 115 from *mahalla*). Ultimately one individual from each household was selected randomly. Thus a total of 4,474 individuals were targeted. Finally, sociodemographic, clinical and audiological data collection could be completed in 4,260 respondents (95%).

Results and comments

Of 4,260 survey respondents 58% were female. Mean age was 32 years. They had four years of median schooling. One-quarter of them were from urban area. In men, students made up 29% of the sample followed by agriculture (28%) and business (14%). In women, homemakers made up 63% followed by students (22%), which is typical of Bangladeshi population.

On clinical assessment, 11.5% respondents had impacted wax in their ear, while 6.2% respondents had chronic infection of middle ear with perforation of ear drum followed by otitis media with effusion (5.3%). Hearing status was assesse by pure tone audiometry and otoacoustic emission test. Slightly more than one-third (34.6%) were found to have some form of hearing impairment (>25 dB in better ear). It was 39.8% in rural area compared with 18.9% in urban area. Prevalence on the basis of nature of hearing loss was also calculated. Among our respondents, conductive, sensorineural and mixed hearing losses were 12.0%, 4.5% and 3.8% respectively. Sensorineural and mixed types of hearing losses were increasingly prevalent with age.

According to WHO definitions 9.6% (95% confidence interval, 8.5%–10.8%) of the total respondents had disabling hearing loss (>40 dB hearing loss in adults and >30 dB hearing loss in better ear in children younger than 15 years). Disabling hearing loss was more prevalent in >60 years (37%). It was equally prevalent between sexes (9.5% in males and 9.6% in females) but more prevalent in socioeconomically deprived population (15.0% in the poorest and 7.6% in the richest wealth quartiles). Logistic regression analysis indicated that age, socioeconomic status, wax, chronic suppurative otitis media, otitis media with effusion and otitis externa are significant predictors of disabling hearing loss in this sample of Bangladeshi population.

In conclusion, chronic suppurative otitis media and otitis media with effusion are major causes of conductive hearing loss. They are preventable and curable by simple treatment and hearing can be restored. On the other hand sensorineural and mixed hearing losses are due to problem of sound transmission through inner ear and auditory nerve pathway. People with this kind of problem can be benefited and rehabilitated by use of hearing aids.

Policy recommendations

The recently launched national strategy on prevention of deafness and hearing impairment in Bangladesh 2011–2016 set a target of reducing avoidable hearing impairment by 90% by 2030 from the existing level. Current study has laid the foundation for measuring the progress towards achievement of the targets with following recommended actions:

1. Otits media, otitis externa and wax are most important diseases related to hearing loss. Therefore deafness prevention activities should primarily be focused on them. Because their prevention and treatment needs simple interventions and they are very common in socio-economically deprived segment of the population, the deafness prevention should be integrated with primary health care system addressing equity. Partnership with education departments will enable early detection of hearing impairment in schools.

2. Intervention for deafness should also focus on sensorineural and mixed type of hearing losses making hearing aids available and accessible with special attention to the elderly (aged 60 years or older) people.

1. Introduction

The burden of hearing impairment and related disability has been growing. Approximately 15% of the world's population has some degree of hearing loss; and many of them are children. WHO[1] in 2013 reported that over 5% of the world's population has disabling hearing loss jeopardizing their daily life and livelihood. The absolute number thus stands at 360 million of which 32 million are children. Childhood development is seriously hampered due to disabling hearing loss.

Hearing impairment is a cause and consequence of poverty, especially in low and middle income countries.[2] In Bangladesh, hearing impairment is the second commonest form of disability and is causing economic, social, educational and vocational problems both for the victims and the country.[3] Many factors including genetic factors, diseases of the mother during pregnancy, various diseases, ototoxic drugs, excessive noise over an extend prolonged period, ageing, etc. are responsible for hearing impairment.[4] Given that children are worst affected by hearing impairment, we must do our best to protect the future generation from this avoidable evil.

One small-scale study done in 2002 reported to WHO a prevalence of 7.9% hearing impairment (in better ear) in Bangladeshi people.[5] Studies in India also reported a similar prevalence (6.3%).[6] The impairment can be up to such a degree that peoples' social life can be restricted. These are known as disabling hearing impairment. WHO estimated a 2.5% prevalence of disabling hearing loss in the South Asian[1] children aged less than 15 years. These indicate that the burden of hearing disability in this region including Bangladesh is very high.

Experiences from other parts of the world indicate that half of hearing loss is preventable through public education, early detection and effective treatment. Experts recommend employing primary health care system to reach out the most. Bangladesh has a very good infrastructure of primary health care. However for proper planning of the programmes or interventions, representative data are essential. So far nationally representative data on prevalence of hearing impairment are not available in Bangladesh. Therefore the present study has been carried out to determine the prevalence of hearing impairment in Bangladesh.

2. Objectives

2.1 General objective

To determine the prevalence of hearing impairment in Bangladeshi people

2.2 Specific objectives

i. To determine the prevalence of ear diseases according to age and sex groups;

ii. To determine the prevalence of various types of hearing impairment according to age and sex groups;

iii. To determine the prevalence of various degree of hearing impairment according to age and sex groups;

iv. To determine the prevalence of various degree of hearing impairment according to socio-economic status;

v. To identify independent factors associated with disabling hearing loss.

3. Methods

This survey was designed to get nationally representative information on hearing impairment burden. It was a cross-sectional study, which followed a modified WHO protocol for a population based survey for determining prevalence and factors of hearing impairment and other ear diseases.[7]

Definition of the study population

The target population of the survey included people of all ages who consider Bangladesh to be their primary place of residence and residing in all geographic areas of the country. The only people excluded from the study were :

- Visiting Bangladesh (e.g., tourists);
- Those who were institutionalized-including people residing in hospitals, prisons, nursing homes, army barracks and other such institutions.

Sampling frame

The sampling frame for this study was the population census conducted by Bangladesh Bureau of Statistics in 2011.[8] There are seven administrative divisions in Bangladesh. Each division is divided into several districts and districts are divided in to sub-districts (upazila). Within a sub-district, *mauza* and *mahalla* are the smallest geographical units with defined boundaries (and a jurisdiction limit number) in rural and urban areas, respectively. They were used as primary sampling units (PSUs) for this study. A *mauza* may be populated or depopulated (such as arable lands) but a *mahalla* is usually populated. Households were used as the secondary sampling units (SSUs) that were defined according to Bangladesh Bureau of Statistics as "A dwelling in which persons either related or unrelated living together and taking food from the same kitchen". People who stayed in that particular household the night preceding the survey day was taken in to account.

Reference population source

The country's population is almost evenly distributed throughout its 64 districts except for Dhaka and Chittagong where it is dense due to large urban gathering and in three hill tracts districts which are rather sparsely inhabited. The number of households is about 32 million. On average, a household consists of 4.4 persons. Urban areas are mainly city corporations and municipalities where population density is higher. However number of persons per household is nearly similar.[8] According to the Census 2011, there are 64,407 PSUs (*mauza* and *mahalla*) in Bangladesh which also include cantonment and depopulated areas (such as areas with less than five households). Cantonments and depopulated areas were excluded. Therefore final PSUs left for this survey was 58,755 (9,474 urban and 49,281 rural).[8]

Selection of sampling units and individuals

The sampling design of this survey is based on the Non-communicable Diseases Risk Factors Survey Bangladesh 2010.[9] It was a cross-sectional study adopting a multistage, geographically clustered, probability-based sampling approach, covering a representative sample of males and females.

Box 1: Division specific sample size and primary sampling units

Division	Population in '000'	Proportion of total population	Total sample required	Urban sample required	Rural sample required	Urban PSUs selected*	Rural PSUs selected*	Total PSUs selected
Barisal	8147	0.057	256	64	192	1	3	4
Chittagong	28079	0.197	883	265	618	2	8	10
Dhaka	46729	0.328	1469	441	1028	4	13	17
Khulna	15563	0.109	489	122	367	1	4	5
Rajshahi	18329	0.129	576	144	432	1	5	6
Rangpur	15665	0.110	492	123	369	1	3	4
Sylhet	9807	0.069	308	77	231	1	5	6
Total	142319	1.000	4474	1159	3315	11	41	52

On an average 115 persons per mahalla, and 80 per mauza were targeted

At the first stage 52 PSUs (11 urban and 41 rural) were selected (locations are shown in Figure1 (Appendix A) with probability proportionate to size from all seven divisions (Textbox 1) followed by a random selection of a SSUs from the map and list of PSUs already available (updating was done if necessary). Eighty households per *mauza* and 115 households per *mahalla* were randomly selected. More households were selected from *mahalla* because they are denser in urban areas (process is illustrated in Textbox 2). One person per SSU was recruited randomly by using Kish table.

Box 2: Stages of sample selection and their techniques

Stages	Selection process
1st	Selection of 52 PSUs (11 urban and 41 rural) from seven divisions to keep proportion of urban-rural population (25% urban for all divisions but 30% for Dhaka and Chittagong divisions)
2nd	Selection of SSUs (average 80 from rural and 115 urban) systematically (every third, fourth or fifth as appropriate with a random start)
3rd	Selection of eligible respondent from household roster using Kish table

Every effort was made to limit non-response to maintain representativeness. If subjects were not at home at the time of first visit, a second visit was made at a mutually agreed time. No third visit was done and no replacement of respondents was considered.

Sample size and response

To determine national prevalence of deafness, assuming a point prevalence of hearing loss as 7.9%[5] in Bangladesh, at 1% precision and with a design effect of 1.75 to adjust within cluster population homogeneity the calculated national sample size was 4,891. Considering individual response rate of 93.3% reported in the recently completed NCD Risk Factor Survey 2010,[9] the sample size was inflated by 6.7% to 5,220. The national sample was distributed in to seven sub sample for seven administrative divisions based on population and *mauza/mahalla* ratio. Out of targeted 5,220 subjects from 52 PSUs, 4,260 (82% in total) were individuals completed the full survey questionnaire and hearing tests.

Training of field team

The research physicians, audiologists and field enumerators (list given in Appendix B) underwent a three-day extensive training in Bangabandhu Sheikh Mujib Medical University (BSMMU) on questionnaire (Appendix C), data collection, an randomization, interview technique, and other relevant issues of field management. Then a dry run was given in the actual field to test the standard operating procedures and also to pretest the questionnaire. Experts from WHO and the investigators conducted the training and field testing. Audiological methods were extensively demonstrated by expert otolaryngologists. All investigators were brought to orientation for uniform understanding of the procedures for field operations.

The questionnaire

The questionnaire had three sections. First section dealt with household and sociodemographic information. Second section was for hearing assessment and the third section was for information regarding basic ear assessment and risk factor of hearing impairment. Each section data were collected by a separate member, and recorded in to three different sheets. The data sheets were then merged after the day's work and sent to project office in Dhaka on periodic basis.

Data collection procedures

The sociodemographic questionnaire was administered by the field enumerators to selected individuals (if 15 years or above) or their parents (if less than 15 years). Information on 20–item household assets was collected to determine their economic status. After administering the sociodemographic questionnaire, the individual was asked to attend the clinical assessment centre placed within the PSU.

The conduction of the study was based on the protocol and standardized questionnaire prepared by the World Health Organization.[7] which has been used by many countries for hearing impairment surveys. For determining status of hearing portable audiometer, tympanometer, otoacoustic emission, otoscope and tuning fork were used.

Calibration of instrument

Audiological equipments were calibrated in BSMMU audiology unit at the beginning. Daily calibrations were done by team members against their known hearing levels during field operations. Validation of the tests, both audiological and otoscopic, was done by comparing a number of subjects, with normal and abnormal hearing or otoscopic findings with a 'gold standard'.